



ET Docket 13-84

~~DA Docket No. 16-1244~~

**Before the Federal Communications Commission
Washington, D.C. 20554**

Accepted / Filed
NOV 09 2017
Federal Communications Commission
Office of the Secretary

To: Office of the Secretary
Federal Communications Commission
Washington, DC 20554

Re: SAT-LOA-20160622-00058

Date: 1 December 2016

DOCKET FILE COPY ORIGINAL

**Comment Filed by: Cindy Sage, Co-Editor, BioInitiative Report
on Behalf of the BioInitiative Working Group**

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Dear Mr. Dortch,

Strong concern has been voiced by scientists and public health and environmental policy experts, that the deployment of technologies that expose billions of people worldwide to new sources of pulse-modulated electromagnetic microwave radiation (EMR) is likely to pose a pervasive risk to public health. The BioInitiative Working Group has previously filed comments documenting this evidence in Docket 13-39 (ET Docket No 13-84 - In the Matter of Reassessment of Federal Communications Commission Radiofrequency Exposure Limits and Policies) and Docket No. 03-137 (Regarding Human Exposure to Radiofrequency Electromagnetic Fields).

The proposal under SAT-LOA-20160622-00058 by Boeing Corporation to launch a global network of 2,956 new satellites to provide wireless internet should be denied. Global proliferation of new wireless radiation sources clearly falls within the definition of 'project that has the potential for a significant environmental impact' on both environmental resources (plants and animals, particularly migrating species) and on human health. The FCC cannot ignore current, uncompleted Dockets on health and safety limits, nor it's obligation to fulfill NEPA requirements.

Prolonged exposure appears to disrupt biological processes that are fundamental to plant, animal and human growth and health. Life on earth did not evolve may pose a pervasive risk to public health. Such exposures did not exist before the age of industry and information. Prolonged exposure appears to disrupt biological processes that are fundamental to plant, animal and human growth and health. Life on earth did not evolve with biological protections or adaptive biological responses to these EMF exposures. A rapidly accumulating body of scientific evidence of harm to health and well- being constitute warnings that adverse health effects can occur with prolonged exposures to very low-intensity EMF at biologically active frequencies or frequency combinations.

The FCC should not approve new and involuntary sources of EMR for Boeing or any other similar proposal unless and until the FCC completes it's review of health and safety issues posed by chronic exposure to low-intensity EMR, has completed relevant environmental reviews under NEPA. A positive assertion of safety cannot be made by the FCC on existing levels of exposure posed by wireless technologies (cell phones, cell towers, wireless utility meters, wireless routers, security systems, baby monitors, wireless educational technologies, wireless medical implants, etc). New biologically-based public exposure standards are urgently needed to protect public health world-wide. No one is keeping track of the growing body-burden of EMR, nor health consequences of ever-rising exposure levels. A clear path to identifying and assessing cumulative impacts on global populations of the sum total of EMR from existing sources is urgently needed before the FCC makes any commitment to projects that add to global radiofrequency radiation levels at this scale.

Respectfully submitted:

Cindy Sage, MA
Co-Editor for the BioInitiative Working Group



APPENDIX A

EVIDENCE THAT CHRONIC EXPOSURE TO LOW-INTENSITY EMR IS TOXIC TO HUMAN HEALTH, REPRODUCTION AND NEUROLOGICAL FUNCTION

The 2012 BioInitiative Report was prepared by 29 authors from ten countries, ten holding medical degrees (MDs), 21 PhDs, and three MsC, MA or MPHs. Among the authors are three former Presidents of the Bioelectromagnetics Society and five full members of BEMS. One distinguished author is the Chair of the Russian National Committee on Non-Ionizing Radiation. Another is a Senior Advisor to the European Environmental Agency. Full titles and affiliations of authors is in Section 25 of the BioInitiative Report at www.bioinitiative.org

The BioInitiative Reports are produced for publication to the broadest possible audience, so placed on the Web. However, much of the BioInitiative Reports content, including updated chapters and new chapters was published in a special two-volume issue of the peer-reviewed journal *Pathophysiology* (August 2009, *Pathophysiology* 16: 2,3). These publications document that chronic exposure to electromagnetic fields (EMF) is associated with increased health risks including cancers (particularly brain cancers), neurological impairment in function and neurological diseases including Alzheimer's disease and ALS, impaired learning, headaches, mental confusion, skin rashes, tinnitus and disorientation. Mental function is impaired. There are more than a dozen studies now establishing significant damage to sperm, resulting in impaired fertility and reproduction.

BioInitiative 2012 Report Conclusions

In twenty-four technical chapters, the BioInitiative Working Group authors discuss the content and implications of about 1800 new studies since 2007. Overall, these new studies report abnormal gene transcription (Section 5); genotoxicity and single-and double-strand DNA damage (Section 6); stress proteins because of the fractal RF-antenna like nature of DNA (Section 7); chromatin condensation and loss of DNA repair capacity in human stem cells (Sections 6 and 15); reduction in free-radical scavengers - particularly melatonin (Sections 5, 9, 13, 14, 15, 16 and 17); neurotoxicity in humans and animals (Section 9); carcinogenicity in humans (Sections 11, 12, 13, 14, 15, 16 and 17); serious impacts on human and animal sperm morphology and function (Section 18); effects on the fetus, neonate and offspring (Section 18 and 19); effects on brain and cranial bone development in the offspring of animals that are exposed to cell phone radiation during pregnancy (Sections 5 and 18); and findings in autism spectrum disorders consistent with EMF/RFR exposure effects. Global precautionary actions that have been taken in countries around the world, and recommended by medical and research experts are documented in Section 22. Use of the Precautionary Principal and it's relevance are presented in Section 23. Key scientific evidence and public health policy recommendations are in Section 24.

1) The 2012 BioInitiative Report concluded again that exposure to EMF and radiofrequency radiation (RFR) produces biological effects and adverse health effects at levels significantly below existing public exposure standards; and substantially below levels identified in 2007.



- 2) The scientific evidence for health harm in 2012 is stronger and more consistent than in 2007; and the levels of exposure at which biological effects and adverse health impacts are reported to occur are far lower than in 2007.
- 3) ICNIRP and IEEE/FCC public safety limits remain unchanged and are still inadequate and obsolete with respect to prolonged, low-intensity NIER exposures. Worse, FCC Dockets 13-84, 03-137 and 13-39 propose to significantly relax rather than tighten exposure standards, in stark contrast to what the scientific evidence suggests is needed to protect public health from RFR.
- 4) Specific absorption rate (SAR) as a measure of compliance with new biologically-based exposure limits should be abandoned. Setting public safety limits based on heating is an unsuitable starting point for developing new standards that properly address chronic exposures to very low-intensity RFR. SAR should not be applied to new biologically-based public exposure standards since by definition SAR is a measure of tissue heating, and the biological effects of NIER are by definition, not due to a heating mechanism. It makes no sense to continue misapplying existing thermal concepts of biological harm, time-averaging and metrics for thermal heating as a basis for detecting and preventing harm from new wireless technologies in the face of strong evidence of harm without measureable heating.
- 5) New, biologically-based public exposure standards should be developed under the direction of experts in the biological effects and adverse health effects of chronic exposures to electromagnetic fields, drawing upon the substantial international body of scientific and public health literature, and not be limited to individuals in electrical and electronic engineering.

References

1. BioInitiative Working Group, Cindy Sage and David O. Carpenter, Editors. BioInitiative Report: A Rationale for a Biologically-based Public Exposure Standard for Electromagnetic Fields (ELF and RF) at www.bioinitiative.org, August 31, 2007.
2. BioInitiative Working Group, Cindy Sage and David O. Carpenter, Editors. BioInitiative Report: A Rationale for Biologically-based Public Exposure Standards for Electromagnetic Radiation at www.bioinitiative.org, December 31, 2012.

ET Docket 13-84



Global Union Against Radiation Deployment from Space

www.stopglobalwifi.org

Before the Federal Communications Commission
Washington, D.C. 20554

Accepted / Filed

NOV 09 2017

Federal Communications Commission
Office of the Secretary

To: Office of the Secretary
Federal Communications Commission
Washington, DC 2055

November 22, 2016 Via E-mail-Electronic Filing

Comment Filed by: GUARDS (Global Union Against Radiation Deployment from Space)

In the Matters of:

*The Boeing Company, Application for Authority to Launch
and Operate a Non-Geostationary Low Earth Orbit
Satellite System in the Fixed Satellite Service.*
IBFS File No. SAT-LOA-20160622-00058
(filed June 22, 2016) (Boeing Application).
For Mobile Radio Services

DA Docket No. 16-1244

Dear Ms. Dortch,

We are writing in opposition to the request by Boeing to add another 2,956 satellites to provide wireless internet service. This would result in increased exposure to radiofrequency (RF) radiation in a way that would be unavoidable. Due to the documented harmful effects of RF radiation exposure on human health and the environment, along with the fact this project violates the U.N. Convention on the Rights of Persons with Disabilities, several sections of the U.N. Convention on the Rights of the Child, and International Human Rights Law in the Universal Declaration of Human Rights, approval of this permit should be denied. Question 9 of the Boeing FCC application asks if there will be an Environmental Impact from the project and the applicant has answered in the negative. We emphatically disagree.

GUARDS is an international coalition against global WiFi from space, a technology that endangers all life on Earth. Wireless connections and transmissions use **pulse-modulated electromagnetic microwave radiation** at low intensity levels. These have been shown by multiple peer-reviewed studies to cause serious adverse bioeffects - genetic, neurological, physiological and psychological damage (<http://www.mainecoalitiontostopsmartmeters.org/?p=1469>). As the evidence of harm continues to mount, between 1993-2013 more than 81 governments and organizations worldwide have banned or warned about the hazards of wireless technology (http://www.cellphonetaskforce.org/?page_id=128).

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On May 27, 2016, the U.S. National Toxicology Program announced that radiation from cellphones is carcinogenic. This finding is consistent with epidemiological studies and other toxicology studies. Yet, global space-based WiFi projects will make this exposure ubiquitous and inescapable both directly from space transmissions and indirectly from expansion of earth-based wireless radiation networks dependent on the satellite networks.

There are legal implications related to irradiating entire countries and their citizens without informed consent. Strong correlations exist between RF radiation exposure from wireless technologies, increasing rates of Radiofrequency Sickness and many cancers. In several countries (Italy, France, Spain, Australia), plaintiffs have gone beyond correlation to successfully prove causation, and damages have been awarded by the courts. The insurance industry currently recognizes the immense risks of insuring companies against radiofrequency injury claims, and coverage from the major firms like Lloyds and Swiss Re is no longer available.

NEPA and Environmental Review

Increased implementation of wireless internet from space/upper atmosphere is a major Federal action significantly affecting the quality of human environment; as such, a NEPA review is triggered. NEPA is not limited to specific projects and FCC approval of additional wireless provided by satellite constitute "major Federal actions." The potential environmental and human health hazards from additional wireless internet from space/upper atmosphere necessitates a comprehensive NEPA review [*Env'tl. Def. Fund v. Tenn. Valley Auth.*, 468 F.2d 1164, 1174 (6th Cir. 1972)] and, specifically, a formal Environmental Impact Statement (EIS). The EIS should include a full review of environmental effects, as well as human health and safety. The FCC has an obligation to evaluate whether "*services or capabilities are essential to public health, safety, or in the public interest*" (H.R. Report No. 104-204, p. 94) and so must protect the public from possible harm caused by radiofrequency radiation.

The FCC is not entitled to essentially disregard comments that do not provide global cost-benefit analysis (*Scenic Hudson v. Federal Power Commission*). The Commission has an affirmative duty to inquire into and consider all relevant facts. The FCC must use government resources to perform the relevant analysis. The FCC should request the EPA use its National Risk Management Research Laboratory resources and experts to conduct all cost analyses necessary.

This proposal also triggers the need for a Memoranda of Understanding (MOU) with U.S. Fish and Wildlife Service under Executive Order 13186 concerning effects on migratory birds.

RF Radiation - Environmentally Harmful and a Public Health Hazard

Environmental Impacts

U.S. Department of Interior States: Current Radiation Standards Inapplicable

On February 7, 2014, the U.S. Department of Interior (DOI) stated, "*the electromagnetic radiation standards used by the Federal Communications Commission (FCC) continue to be based on thermal heating, a criterion now nearly 30 years out of date and inapplicable today*," in reference to the current limits governing radiation utilized by WiFi. The DOI letter discusses a number of studies in which birds appear harmed by low-level RF radiation associated with cell towers and other wireless technologies (http://www.ntia.doc.gov/files/ntia/us_doi_comments.pdf). **Furthermore, DOI required FirstNet to undergo a comprehensive NEPA review and planning program. Implementation of Boeing's project which will have similar widespread impacts must do so as well.**

RF radiation kills and damages trees

Trees and other vegetation are being killed and damaged across the U.S. and world-wide even without the addition of further RF radiation exposure, such as Boeing's project will entail. RF radiation is being implicated as the cause. Several studies show the very serious effects that RF radiation has on the health of trees. Trees, agricultural crops and other plants are essential to the welfare of the global environment and the continuation of the human race. Decimation of the amazon rainforest by direct human actions has been oft-cited as endangering the global environment, the FCC should not be moving forward with implementing further wireless broadband and 5G wireless, that will hasten the RF caused death of our urban and rural forests, cropland and other vegetation and associated insect/pollinator life. Please read the following papers to see the toll RF is already taking on trees. We cannot afford additional forest die-off. Large mature trees are being seriously damaged and killed, this damage will take 50 years or more to repair.

- Radiofrequency radiation injures trees around mobile phone base stations:
https://www.researchgate.net/publication/306435017_Radiofrequency_radiation_injures_trees_around_mobile_phone_base_stations
- Adverse Influence of Radio Frequency Background on Trembling Aspen Seedlings: Preliminary Observations
<https://www.hindawi.com/journals/ijfr/2010/836278/>
- Review: Weak radiofrequency radiation exposure from mobile phone radiation on plants:
<http://www.ncbi.nlm.nih.gov/pubmed/27650031?dopt=Abstract>
- Tree damage in the vicinity of mobile phone base stations: <http://kompetenzinitiative.net/KIT/wp-content/uploads/2016/06/Tree-damages-in-the-vicinity-of-mobile-phone-base-stations.pdf>
- The trees make it easy to recognize the effects of RF-EMF. Examples of tree damage:
<http://kompetenzinitiative.net/KIT/wp-content/uploads/2016/09/Trees-in-Bamberg-and-Hallstadt-Documentation-2006-2016.pdf>

RF radiation kills and impairs reproduction of wildlife

A parade of studies continue to be published implicating wireless technology in the demise of frogs, bats, and honey bees, the threatened extinction of the house sparrow, and damage to the DNA of the human species. It is vital to the continuation of life that large parts of Earth are spared the incessant radiation that accompanies wireless technologies.

- "The Report on Possible Impacts of Communication Towers on Wildlife Including Birds and Bees" commissioned on 30th August 2010 by the Ministry of Environment and Forest, Government of India
http://www.moef.nic.in/downloads/public-information/final_mobile_towers_report.pdf
- "Impacts of radio-frequency electromagnetic field (RF-EMF) from cell phone towers and wireless devices on biosystem and ecosystem – a review," http://www.biolmedonline.com/Articles/Vol4_4_2012/Vol4_4_202-216_BM-8.pdf
- Balmori, A. "Electromagnetic pollution from phone masts. Effects on wildlife," *Pathophysiology* (2009), doi:10.1016/j.pathophys.2009.01.007 <http://www.ncbi.nlm.nih.gov/pubmed/19264463>
- October 31, 2014 presentation to the Manitoba Entomological Society, reviewing 91 studies on the effects of RF/MW radiation on honey bees, insects, birds, etc:
https://groups.google.com/forum/#!topic/mobilfunk_newsletter/0RUPGTI4qQY

- A BRIEFING MEMORANDUM: What We Know, Can Infer, and Don't Yet Know about Impacts from Thermal and Non-thermal Non-ionizing Radiation to Birds and Other Wildlife — for Public Release July 14, 2016. Albert M. Manville, II, Ph.D., C.W.B.
<http://www.mainecoalitiontostopsmartmeters.org/wp-content/uploads/2016/07/Manville-7-14-2016-Radiation-Briefing-Memo-Public.pdf>

High Energy Consumption of Global Wireless

Wireless technology is an environmentally damaging technology for many reasons, including the fact that wireless connectivity uses far more energy than wired connectivity. According to *Energy Consumption in Wired and Wireless Access Networks*, “**Wireless technologies will continue to consume at least 10 times more power than wired technologies** when providing comparable access rates and traffic volumes. PON [passive optical networks] will continue to be the most energy-efficient access technology.” (<http://people.eng.unimelb.edu.au/rtucker/publications/files/energy-wired-wireless.pdf>), even as technology becomes more energy efficient. A higher amount of energy is consumed in transmitting large amounts of information through the air (a medium that has high resistance and high level of signal absorption) compared to transmission via various corded communication connections (e.g., copper or fiber optic based). In fact, in a paper looking at the energy consumption of cloud computing, the authors state, “**Our energy calculations show that by 2015, wireless cloud will consume up to 43 TWh**, compared to only 9.2 TWh in 2012, an increase of 460%. This is an increase in carbon footprint from 6 megatonnes of CO2 in 2012 to up to 30 megatonnes of CO2 in 2015, **the equivalent of adding 4.9 million cars to the roads**. Up to **90% of this consumption is attributable to wireless access network technologies**, data centres account for only 9%.” (<http://www.ceet.unimelb.edu.au/publications/ceet-white-paper-wireless-cloud.pdf>) While the article discusses cloud computing as though it is an energy saver, it is clear from the discussion that those energy savings are only realized if the cloud replaces individual computing power. Otherwise, cloud computing only causes additional energy consumption and should not be promoted as an environmentally-friendly technology. The energy wastefulness of wireless technology should cause the FCC serious pause in its promotion of wireless technology. So should the very serious health and environmental effects of the RF radiation wireless technology emits.

Atmospheric Impacts of Global Wireless, Including 5G from Space/Upper Atmosphere

Global wireless from space as envisioned by telecommunications giants would utilize extensive satellite networks and require the launch of hundreds of kerosene-burning rockets annually. This would re-distribute the ozone layer and significantly contribute to climate change (<http://www.eucass-proceedings.eu/articles/eucass/pdf/2013/01/eucass4p657.pdf>).

Martin Ross of the Aerospace Corporation was the lead author of a paper published in 2010 titled "Potential climate impact of black carbon emitted by rockets" (<http://onlinelibrary.wiley.com/doi/10.1029/2010GL044548/abstract>). The authors developed a computer model to predict what would happen in different parts of the planet if the number of launches burning kerosene (then 25 annually) increased by a factor of ten. His model predicts as much as a 4% loss of ozone over the tropics and subtropics, as much as a 3-degree Celsius summertime increase in temperature over the South Pole, more than a one-degree overall increase in Antarctic temperature, and a decrease in Antarctic sea ice by 5% or more.

In a 2011 Aerospace article titled "Rocket Soot Emissions and Climate Change" (<http://www.aerospace.org/crosslinkmag/summer2011/rocket-soot-emissions-and-climate-change/>), Ross states “The Aerospace study shows that the radiative forcing of soot from a given hydrocarbon rocket scenario is as much as 100,000 times that of the carbon dioxide from the rockets.” Obviously, the soot or black carbon emissions would be an important factor in accelerating climate change if the planned launches move forward.

Solid state rocket exhaust is no better. It contains ozone-destroying chlorine, water vapor (a greenhouse gas), and aluminum oxide particles, which seed stratospheric clouds. Complete ozone destruction is observed in the exhaust plumes of solid state rockets.

The New York Times (May 14, 1991, p. 4; <http://www.nytimes.com/1991/05/14/news/some-say-the-rockets-red-glare-is-eating-away-at-the-ozone-layer.html>) quoted Aleksandr Dunayev of the Russian Space Agency saying, "About 300 launches of the [space] shuttle each year would be a catastrophe and the ozone layer would be completely destroyed."

At that time, the world averaged only 12 rocket launches per year. Maintaining a fleet of (ultimately) 4,000 satellites, each with an expected lifespan of five years, will likely involve enough yearly rocket launches to be an environmental catastrophe.

Project Loon utilizes a scarce resource - helium - with reckless abandon. Helium is key to the function and manufacture of many technologies. Helium also has important scientific and hospital uses. It is a scarce fossil resource (<http://phys.org/news/2010-08-world-helium-nobel-prize-winner.html>) and should be conserved, not squandered. The balloons used by Project Loon are inflated with helium which is released into the atmosphere when the balloons are grounded. Furthermore, the balloons are made of polyethylene plastic which is not biodegradable, yet the balloons are only expected to have a life-span of 10 months. Our best estimate is that it would take 100,000 balloons to provide wireless to landmasses worldwide. This is a lot of polyethylene to discard and a lot of helium to squander.

United Nations Rio Declaration on Environment and Development

The Precautionary Principle as drawn up in Rio in 1992 - the Rio Declaration: <http://www.gdrc.org/u-gov/precaution-7.html>

In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

Principle 15 codified for the first time at the global level the precautionary approach, which indicates lack of scientific certainty is no reason to postpone action to avoid potentially serious or irreversible harm to the environment. Central to principle 15 is the element of anticipation, reflecting a requirement that effective environmental measures need to be based upon actions which take a long-term approach and which might anticipate changes on the basis of scientific knowledge.

From the U.N. General Assembly: Resolution adopted by the General Assembly July 2012 66/288 The Future We Want

We recognize the importance of strengthening international, regional and national capacities in research and technology assessment, especially in view of the rapid development and possible deployment of new technologies that may also have unintended negative impacts, in particular on biodiversity and health, or other unforeseen consequences.

http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/66/288&Lang=E

An ETC Group Press Release [UN Moves Towards an Early Listening System](#) shares: "*The decision paves the way for a badly needed early warning system on the impacts of new technologies*" and explains:

ETC Group proposed the creation of a technology assessment capacity in the UN in the lead up to the 2012 Rio Summit. At that time, the proposal was backed by the G-77 and China and a few OECD states such as Sweden and Norway. The Summit concluded with a surprisingly strong call for technology assessment from local to global levels warning that new technologies could pose significant health and environmental risks.

<http://www.etcgroup.org/content/un-moves-towards-technology-early-listening-system>

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And from *The Lancet*:

Planetary health is a new science that is only beginning to draw the coordinates of its interests and concerns. It demands new coalitions and partnerships across many different disciplines to meet the pervasive knowledge failures identified by this Commission. It demands new attention to governance and implementation. And, perhaps most of all, it demands more creative imagination among scientists and practitioners working in health—redefining the meaning of human progress, rethinking the possibilities for human cooperation, and revitalizing the prospects for the health of human civilizations. (par 7)

and

Second, planetary health concerns the natural systems within which our species exists—for example, the health and diversity of the biosphere. Human beings live within a safe operating space of planetary existence. If the boundaries of that space are breached, the conditions for our survival will be diminished." Currently, natural systems are being degraded to an extent unprecedented in history, with known and as yet unknown and unquantified effects on human health. (par 2)

[http://www.thelancet.com/pdfs/journals/lancet/PIIS0140-6736\(15\)61038-8.pdf](http://www.thelancet.com/pdfs/journals/lancet/PIIS0140-6736(15)61038-8.pdf)

Human Health Impacts

U.S. National Toxicology Program: Radiation from Cellphones Carcinogenic

The U.S. National Toxicology Program released results showing that exposure to non-thermal levels of pulse-modulated microwave radiation causes cancer, specifically intracardiac schwannomas and malignant gliomas, and breaks DNA (<http://ehtrust.org/science/facts-national-toxicology-program-cellphone-rat-cancer-study/>). Epidemiological data show that the rate of glioblastoma multiforme of the brain, a malignant type of glioma, is increasing (<http://microwavenews.com/news-center/ntp-and-brain-tumor-rates>). Obviously the results of this study support an immediate halt to the implementation of further wireless internet and 5G projects, like Boeing's, pending safety evaluation.

FCC Investigation of Current Exposure Limits Underway

With the FCC finally beginning re-evaluation of current irrelevant and obsolete non-ionizing RF exposure guidelines, it seems imprudent to move forward with increasing wireless internet and 5G, which encourage global proliferation of RF microwave radiation. This evaluation should be completed prior to approving Boeing's project.

In the Inquiry the FCC requests comment to determine whether its RF exposure limits and policies need to be reassessed. Since consideration of the limits themselves is explicitly outside of the scope of ET Docket No. 03-137, the FCC opened a new docket, ET Docket No. 13-84, with the Inquiry to consider these limits in light of more recent developments. The Inquiry is intended to open discussion on both the currency of our RF exposure limits and possible policy approaches regarding RF exposure (<https://www.fcc.gov/encyclopedia/radio-frequency-safety>).

International Recognition of Need for More Conservative RF Safety Limits

Countries around the world are increasingly recognizing the risks of RF radiation and advising action to protect the public (http://www.cellphonetaskforce.org/?page_id=128). Even the U.S., as cited above, is in the process of reviewing RF exposure guidelines. Countries such as China, Russia, Italy and Switzerland already have wireless radiation safety limits 100 times lower than the United States.

Even ICNIRP recognizes the need to protect vulnerable populations by lowering general exposure levels: "Different groups in a population may have differences in their ability to tolerate a particular NIR (non-ionizing radiation) exposure. For example, children, the elderly, and some chronically ill people might have a lower tolerance for one or more forms of NIR exposure than the rest of the population. Under such circumstances, it may be useful or necessary

to develop separate guideline levels for different groups within the general population, but it may be more effective to adjust the guidelines for the general population to include such groups.” from ICNIRP Statement, General Approach to Protection Against Non-ionizing Radiation, (HEALTH PHYSICS 82(4):540- 548; 2002)

<https://www.icnirp.org/documents/philosophy.pdf>

Canada: Previous Safety Code 6 Inadequate

In June 2015, Canadian Parliament’s Standing Committee on Health (HESA) issued a report with 12 unanimous recommendations for increased caution, investigations, reporting and data gathering with regard to RF/EMF and wireless devices. Health Canada’s Safety Code 6 provided guidelines for RF exposure virtually identical to 1996 FCC guidelines until recently (March 2015) when Canada reduced some of its maximum permissible exposure limits by nearly 50%.

“The [HESA] Committee agrees that the potential risks of exposure to RF fields are a serious public health issue that needs to be brought to the attention of Canadians so that they have the knowledge to use wireless devices responsibly and are able to make decisions about the use of wireless devices in a manner that protects their health and the health of their families.”

The Standing Committee report shares themes, including cancer, illness, fertility, autism, public awareness, school environments, and medical responsibilities. It discusses studies demonstrating adverse effects at levels below Health Canada’s guidelines

(http://www.parl.gc.ca/Content/HOC/Committee/412/HESA/Reports/RP8041315/412_HESA_Rpt13_PDF/412_HESA_Rpt13-e.pdf).

World Health Organization (WHO) Scientists Warn of Increased Risk to Public Health

Increases in microwave radiation exposure caused by planned airborne wireless deployments will be harmful to public health. Wireless technology operates using pulse-modulated microwave radiation: “*The human body*,” says Dr. G.J. Hyland (International Institute of Biophysics, Neuss-Holzheim, Germany), “*is an electrochemical instrument of exquisite sensitivity*,” noting that, “*like a radio, it can be interfered with by incoming radiation*.” If a signal is strong enough to operate a device, it is strong enough to disturb every cell in the human body.

In 2011, the International Agency for Research on Cancer (IARC), a committee of the WHO, classified RF radiation as a Group 2B carcinogen in the same category as lead, engine exhaust, and DDT. Alarming, several scientists who were members of the IARC working group involved with this classification now conclude the risks are much greater than originally thought. For example, Dr. Dariusz Leszczynski warns that RF-EMF should be classified as a Group 2A carcinogen, and Dr. Lennart Hardell reports that several studies indicate a Group 1 classification is justified, placing RF-EMF in the same category as tobacco, asbestos, and benzene.

Dr. Dariusz Leszczynski MSc, DSc, PhD

<https://betweenrockandhardplace.wordpress.com/2014/08/14/carcinogenicity-of-cell-phone-radiation-2b-or-not-2b/>

“In conclusion, I consider that currently the scientific evidence is sufficient to classify cell phone radiation as a probable human carcinogen – 2A category in IARC scale. Time will show whether ‘the probable’ will change into ‘the certain’. However, it will take tens of years before the issue is really resolved. In the mean time we should implement the Precautionary Principle. There is a serious reason for doing so.”

Dr. Lennart Hardell MD, PhD <http://www.ncbi.nlm.nih.gov/pubmed/24192496>

“Based on the Hill criteria, glioma and acoustic neuroma should be considered to be caused by RF-EMF emissions from wireless phones and regarded as carcinogenic to humans, classifying it as group 1 according to the IARC classification. Current guidelines for exposure need to be urgently revised.”

Statements like these support our contention that no new large-scale irradiation of the public should be allowed prior to establishment of biologically protective RF safety limits. In fact, condoning such a project without first updating RF safety limits to be biologically protective of the whole population for the exposures they are likely to experience daily would be in direct violation of the entire Nuremberg Code of Ethics (<http://www.hhs.gov/ohrp/archive/nurcode.html>).

International Scientists Warn of High Risk and Multigenerational Effects

The 1,500-page BioInitiative Report on RF/MW health effects was published in 2012. The authors are 29 scientists from 10 countries. They reviewed thousands of studies showing interference with chemical processes in the body, implicating RF/MW in a whole spectrum of alarming effects including genetic damage, cancer, immune dysfunction, neurological injury, and infertility www.bioinitiative.org.

More recently, in 2015, over 220 scientists from 41 countries with over 2,000 peer-reviewed journal articles to their collective credit in the field of biological impacts from RF/EMF appealed to the U.N. and the WHO for greater precautions with regard to exposures from wireless technologies. This is the latest in many such alerts to the health effects of RF/EMF exposure <https://www.emfscientist.org/>.

A paper by Microwski, *Electromagnetic Fields: High Level Microwave Technology Concerns* <http://c4st.org/images/documents/wifi-in-schools/doclinks/RFCorrosion.etc-1.pdf> references a study by Magras and Xenos 1997, *RF Radiation-induced Changes in the Prenatal Development of Mice* <http://www.ncbi.nlm.nih.gov/pubmed/9261543>. The study indicates at environmental wireless exposure levels (0.168 $\mu\text{W}/\text{cm}^2$ to 1.053 $\mu\text{W}/\text{cm}^2$) lower than those now commonplace outdoors in Canadian cities such as Metro Toronto, Hamilton, Mississauga, mice become infertile between third and fifth generations.

The continuous exposure to microwave radiation from global wireless, along with that emitted from a myriad of wireless devices, may have implications far greater than we could imagine with nothing less than the continuation of the human race at stake.

Violation of International Human Rights

Wireless internet from space/upper atmosphere and 5G violate Article 3 of The U.N. Declaration of Human Rights, ratified by the General Assembly in 1948, which states “*everyone has the right to life, liberty and security of person.*” Data exist showing RF radiation can cause serious biological effects at levels far below the existing FCC RF limits (www.bioinitiative.org). These include damage to DNA which can lead to an increased risk for cancer and deleterious genetic mutations passed on to future generations. Decreases in sperm count and quality and increases in miscarriage and infertility have also been demonstrated in response to exposure to RF radiation. Although much of the recent research focuses on frequencies in WiFi and cellphone ranges, prior research is available showing serious biological effects in the millimeter wavelengths that are being proposed for 5G wireless.

Observed higher resonance frequencies of a living cell coincide with frequencies of radiation of communications satellites. The power densities and duration of irradiation created by these satellites will significantly exceed (by ten or more orders of magnitude—such irradiation is possible over the course of a whole lifetime) the energetic doses inducing changes in living cells.

Negative consequences of this may be changes in cell structures and physiological processes, genetic changes, and alteration of psychophysiological conditions and behavior
(http://www.stopglobalwifi.org/documents/2001_kositsky_et_al._-ussr_review.pdf).

More recent scientific publications look specifically at causality, such as M.L. Pall in “*Microwave Frequency Electromagnetic Fields (EMFs) Produce Widespread Neuropsychiatric Effects Including Depression*” (J Chem

Neuroanat. 2015 Aug 20; <http://www.sciencedirect.com/science/article/pii/S0891061815000599>). It discusses the causal relationship between exposure to radiation from wireless technology and neuropsychiatric effects. Mechanisms of action are also discussed.

Yakymenko, et al., 2014 discuss the fact that RF radiation is documented in numerous studies to cause oxidative damage and discuss mechanisms (*Low Intensity Radiofrequency Radiation: A New Oxidant for Living Cells*; Oxid Antioxid Med Sci 2014; 3(1):1-3; (https://www.researchgate.net/publication/269995792_Low_intensity_radiofrequency_radiation_a_new_oxidant_for_living_cells)).

A more recent study by Yakymenko, et al., 2015, *Oxidative Mechanisms of Biological Activity of Low-intensity Radiofrequency Radiation* finds in 93 of 100 reviewed studies a wide pathogenic potential of the induced Reactive Oxygen Species (ROS) and their involvement in cell signaling pathways explains a range of biological/health effects of low intensity RF radiation, which include both cancer and non-cancer pathologies. Their concluding analysis demonstrates low-intensity RF radiation is an impressive oxidative agent for living cells with a high pathogenic potential and that the oxidative stress induced by RF radiation exposure should be recognized as one of the primary mechanisms of the biological activity of this kind of radiation. (<http://www.mainecoalitiontostopsmartmeters.org/wp-content/uploads/2015/07/Yakymenko-et-al-2015.pdf>)

Lerchl, et. al. in 2015 performed a replication experiment of work done by Tilmann, et. al. in 2010 but increased the number of mice. Their work: *Tumor Promotion by Exposure to Radiofrequency Electromagnetic Fields Below Exposure Limits for Humans* found tumors in mice promoted by exposures to levels of RF at below government exposure limits for the use of mobile phones. Numbers of tumors of the lungs and livers in exposed animals were significantly higher than in sham-exposed controls. In addition, lymphomas were also found to be significantly elevated by exposure (<http://www.ncbi.nlm.nih.gov/pubmed/25749340>).

Industry continues to falsely claim that there are no known mechanisms by which the non-ionizing radiation emitted by wireless devices can cause cancer. Oxidants lead to the formation of free radicals. Free radicals may cause DNA breakage and, therefore, cancer. Radiation from wireless devices has been found to cause oxidative damage. Therefore, oxidative damage is one mechanism by which radiation from wireless devices may cause cancer.

Replicated double-blind studies show that a cordless phone base station operating at WiFi frequencies can cause cardiac arrhythmias in susceptible individuals (<http://www.magdahavas.com/wordpress/wp-content/uploads/2012/01/Havas-HRV-Ramazzini.pdf> and www.ncbi.nlm.nih.gov/pubmed/23675629#). Flooding the globe with radiation that can have such a serious, even deadly effect, is unethical. A study in rabbits found that not only did WiFi change heart function parameters, but it dramatically changed the cardiac effects of both dopamine and epinephrine: Saili L, et al. *Effects of Acute Exposure to WIFI Signals (2.45 GHz) on Heart Variability and Blood Pressure in Albinos Rabbit*. Environmental Toxicology and Pharmacology 40 (2015) 600–605; (<http://www.sciencedirect.com/science/article/pii/S1382668915300594>). Therefore, ubiquitous RF radiation may not only cause cardiac emergencies, but prevent treatments from working and cause deaths. The threat to cardiac health is also supported by epidemiological studies showing increased death from cardiac events and heart disease - Criticism of the Health Assessment in the ICNIRP Guidelines for Radiofrequency and Microwave Radiation (100 kHz - 300 GHz) (www.electricalpollution.com/documents/Cherry2000EMR_ICNIRP_critique_09-02.pdf).

Forced exposure to an agent that has the effects discussed above and enumerated in the resources listed above would have to be considered a violation of the Nuremberg Code of Ethics (<http://www.hhs.gov/ohrp/archive/nurcode.html>). An increase in wireless internet from space/upper atmosphere and 5G would force such an exposure.

Furthermore, global wireless proposals violate Article 25 of International Human Rights (1), which states, “Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, housing and medical care and necessary social services, and the right to security in the event of

unemployment, sickness, disability, widowhood, old age or other lack of livelihood in circumstances beyond his control.”

Exposure to an agent that disrupts hormones, sleep, cardiac and neurological function, and has forced numerous people from their homes and into poverty is an obvious violation of numerous fundamental rights which are to be universally protected according to The U.N. Declaration of Human Rights.

Violation of U.N. Convention on the Rights of the Child

Under the Convention on the Rights of the Child, states/countries are responsible for acting in their children's best interest. In this case, that would mean halting implementation of additional wireless internet from space/upper atmosphere, pending medical-grade safety testing.

In a letter to Congress, the American Academy of Pediatrics stated:

“Children are disproportionately affected by environmental exposures, including cell phone radiation. The differences in bone density and the amount of fluid in a child's brain compared to an adult's brain could allow children to absorb greater quantities of RF energy deeper into their brains than adults.”

<http://apps.fcc.gov/ecfs/document/view?id=7520941318>

No child should be forced to be exposed to RF radiation and therefore forced to incur an increased risk of cancer, functional impairment leading to ill health or cognitive impairment, or genetic damage in *their* children.

Any of these outcomes, which research supports as likely, violate children's rights. Electromagnetic Radiation, Health and Children 2014 by Dr. Erica Mallery-Blythe (<https://www.youtube.com/watch?v=sNFdZVeXw7M>) is a must-watch presentation about the hazard that RF radiation emitted by wireless technology poses to children.

Dr. Mallery-Blythe's presentation references several U.N. Conventions on the Rights of the Child that would be violated by this project including:

Article 3 (best interests of a child) The best interests of a child must be a top priority in all decisions and actions that affect children.

Article 23 (children with a disability) A child with a disability has the right to live a full and decent life with dignity, and, as far as possible, independence and to play an active part in the community. Governments must do all that they can to support disabled children and their families.

Article 24 (health and services) Every child has the right to the best possible health. Governments must provide good quality health care, clean water, nutritious food and a clean environment and education on health and well-being so that children can stay healthy

Article 28 (right to education) Every child has a right to education.

A Brief from the Canadian Teachers' Federation, *The Use of WiFi in Schools* (2014), warns, “*Teachers and school communities have not been informed regarding the implementation of WiFi and any inherent potential hazards*” and goes on to share, “*Teachers are rightly concerned for their personal safety and the safety of the children in their care*” (<http://www.ctf-fce.ca/Research-Library/wifi-final-2014-ENG.pdf>).

Schools, unions and PTAs worldwide have issued statements, enacted policy and are calling for safer, wired technology in schools to address this unprecedented health disaster (<http://ehtrust.org/policy/schools-unions-and-pta-actions/>).

Violation of U.N. Convention on the Rights of Persons with Disabilities

Increasing numbers of countries, such as Sweden and France, (as do the Canadian Human Rights Commission and European Parliament) recognize Electrohypersensitivity (EHS) as an environmentally induced functional impairment or disability triggered by exposure to electromagnetic fields (including RF). Continental or global WiFi would contravene: Article 1 “*promote, protect and ensure the full and equal enjoyment of all human rights and fundamental freedoms by all persons with disabilities, and to promote respect for their inherent dignity*”; Article 3 “*Full and effective participation and inclusion in society*”; Article 15(2) states: “*Parties shall take all effective legislative, administrative, judicial or other measures to prevent persons with disabilities, on an equal basis with others, from being subjected to torture or cruel, inhuman or degrading treatment or punishment*”; and violate the intent of many more Articles, since the planet would be blanketed with microwave radiation that those suffering EHS could not escape.

The European Economic and Social Committee (EESC) is an E.U. advisory body comprising representatives of workers’ and employers’ organizations and other interest groups. It issues opinions on E.U. issues to the European Commission, the Council of the E.U., and the European Parliament, thus acting as a bridge between the E.U.’s decision-making institutions and E.U. citizens. In February 2015, a formal letter of notice was sent to the EESC by the Radiation Research Trust (based in U.K.) and approximately 90 other organizations from around the world in support of millions of people, estimated to be between 22,000,000 and 37,000,000 throughout Europe currently suffering EHS due to exposure to the proliferation of RF emissions and emitters (i.e., mobile phones, DECT cordless phones, cordless baby monitors, phone masts, WiFi, smart meters, the smart grid, et al.) (http://www.radiationresearch.org/images/rrt_articles/EM-Radiation-Research-Trust-Letter-of-Notice-Served-on-Mr-Richard-Adams.pdf).

Some researchers estimate approximately 3% of the population has severe symptoms of EHS and another 35% of the population has moderate symptoms such as impaired immune system and chronic illness (Havas, 2007).

Canadians For Safe Technology (C4ST) points out, “*EHS is accepted as a functional impairment in Sweden and the Canadian Human Rights Commission recognizes it as an environmental sensitivity and classifies it as a disability.*” With some countries already recognizing the medical needs of those affected by EHS and the potential for millions of people around the world to suffer EHS from increased exposure to radiation from wireless technology, further proliferation of wireless technology on a wide scale is unacceptable.

Jenny Fry (age 15) hanged herself when her school refused to understand that being in classrooms with WiFi caused her to experience serious physical discomfort and harassed and bullied her by requiring her to serve detentions for leaving classes due to WiFi induced symptoms in rooms where she experienced intense functional impairment (<http://www.independent.co.uk/news/uk/home-news/school-girl-found-hanged-after-suffering-from-allergy-to-wifi-a6755401.html>).

International Human Rights, Article 26 states that “(1) *Everyone has the right to education.*” People with disabilities and functional impairments like Jenny’s have a right to go to school in an environment free from RF radiation, in a school that will not make them sick. Her rights, like the rights of all those experiencing this type of functional impairment, should be protected under the Universal Declaration of Human Rights.

Many other persons experience similar functional impairment when exposed to RF radiation: “Parents Sue School, Claim Wi-Fi Makes Son” (<https://www.yahoo.com/parenting/parents-sue-school-claim-wi-fi-makes-son-sick-127644771007.html>), “WiFi in Schools: How Safe” (<http://www.publicnewsservice.org/2014-09-22/health-issues/wifi-in-schools-how-safe/a41810-1>) and “Maryland woman suffers acute radiation exposure from a bank of smart meters” (<https://www.youtube.com/watch?x-yt-cl=84503534&x-yt-ts=1421914688&v=F9QZuWPw6Y0>).

Insurance Companies Warn of Large Losses Due To Electromagnetic Fields

We also note that insurance in the event of injury due to RF/MW radiation is not likely to be adequate – see pages 1 and 2 in the document at the following link:

<http://www.gao.gov/assets/600/591391.pdf>

Stop Smart Meters UK shares that: “Insurance Firm, Swiss Re, Warns of Large Losses from “Unforeseen Consequences” of Wireless Technologies: <http://stopsmartmeters.org.uk/insurance-firm-swiss-re-warns-of-large-losses-from-unforeseen-health-claims-due-to-wireless-technologies/> (Source: swissre.com)

Specialists from the Emerging Risks team at leading global reinsurance firm, Swiss Re, are warning the insurance industry that “unforeseen consequences of electromagnetic fields” could lead to a raft of claims and significant product liability losses in the next 10 years.

In its Swiss Re SONAR Emerging Risks report, 2013, which covers risks that could “*impact the insurance industry in the future*”, the company categorizes the impact of health claims related to electromagnetic fields (EMFs) as ‘high’. It acknowledges recent reports of courts’ ruling in favor of claimants who have experienced health damage from mobile phones, and also says that anxiety over risks related to EMFs is “on the rise”.

The document states that whilst the majority of the topics covered in its pages were of “medium impact”, health issues associated with EMFs sit in the highest impact category. Other topics discussed include the dangers of cyber attacks, power blackouts, workplace safety and Big Data all of which are exacerbated and/or added to with the ill-conceived “smart” metering programs.

Lloyd’s listed hazards from new technologies including EMF in its 2011 Top 50 Risks. Coverage for RF/EMF injuries typically related to cell phones and cell towers is now categorically excluded. In their 2013 Risk Report, new technology risks have increased slightly in risk rank. It is worth noting these risks are classified under Environmental (i.e., does the applicant expect to have an adverse environmental impact?) as distinct from the Lloyd’s appraisal of cybersecurity risks (also applicable to 5G wireless and rated much higher risk).

<http://www.lloyds.com/~media/Files/News%20and%20Insight/Risk%20Insight/Risk%20Index%202013/Report/Lloyds%20Risk%20Index%202013report100713.pdf>

GUARDS asserts that wireless internet from space/upper atmosphere and 5G would intensify these concerns on a continental and global scale.

Interference with Airplane Instrumentation and Hazard to Flight Crew and Passengers

The satellite portion of the proposed 5G wireless project would locate transmitters at altitudes where they could cause dangerous interference with aircraft.

Wireless signals are already causing interference with aircraft systems. An FAA Airworthiness Directive (or AD) points out that WiFi on board aircraft is blanking out display units in the cockpit (<http://www.b737.org.uk/ad-2014-20-06.pdf>, <https://s3.amazonaws.com/public-inspection.federalregister.gov/2014-23231.pdf>). The FAA has given a five-year time limit for airlines to replace all these display units. However, even new units may not be able to withstand the strength of signal that the Boeing satellite project would expose them to. There is reason for concern because the same AD mentions, “The intent of this AD is to eliminate this known susceptibility of the phase 3 DUs to RF transmissions, including those from sources outside the airplane. This susceptibility is not limited to WiFi transmissions, but has been verified to exist in a range of the RF spectrum used by mobile satellite communications, cell phones, air surveillance and weather radar, and other systems.”

Furthermore, the signal strength will certainly be strong enough to cause biological functional impairment of the flight crew and the passengers. Since biological functional impairment induced by exposure to RF radiation from wireless technology can range from minor to serious, even including death, it is of paramount importance for the safety of air travel that the permit be denied.

Conclusion

Increased health care costs, increased disability and associated costs, decreased productivity from missed or substandard work performance, lost or compromised ecological services and agricultural harm from RF-EMF exposure could cost societies billions of dollars. Not only is RF-EMF proliferation bad for health and the environment directly, this damage has a major economic cost as well.

Please consider our comments as reasons a permit for Boeing's proposed project should be denied. In brief, those reasons include insurance industry recognition of serious risk to health, cyber and national security, demonstrated detrimental biological effects at levels far below existing inadequate RF safety limits, radiofrequency radiation currently classified "*possible human carcinogen*" by the World Health Organization, legal implications related to irradiating the entire continent without informed consent, personal security risks, and resultant violations of U.N. Conventions and Universal Declaration of Human Rights.

Because the potential global effects of this and similar proposals from Google, Facebook, SpaceX and others are devastating, any consideration must proceed only with maximum levels of due diligence, including full public access to application documents and all project specifications.

Global wireless access, with all its serious safety problems, is an unacceptable hazard. Widely available fast internet access is a goal that can be safely attained using various forms of cabled connectivity.

GUARDS respectfully requests Boeing's application be denied.

Sincerely,

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GUARDS is an international coalition against global WiFi from space, a complex technology of radiation and toxic chemicals endangering all life on Earth.